# SITE NEED STATEMENT

## General Reference Information

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| **Need Title:** | **Deep Well Sampling** |
| **Need Code:** | NV02-0200-02S |
| **Need Summary:** | Cost-effective well design and sampling technologies are needed for sampling groundwater for radionuclides and other physical and chemical parameters in deep (up to1,500 meters) wells in remote areas. Current methods may perturb the in situ conditions to the extent that unrealistic solution chemistry and colloidal concentrations may be detected or in other ways result in samples whose analytical results are unrepresentative of formation waters at depth. |
| **Origination Date:** | August 1, 2001 |
| **Need Type:** | Science |
| **Operations Office:** | NNSA/NV |
| **Geographic Site Name:** | Nevada Test Site |
| **Project:** | NV212/Underground Test Areas |
| **National Priority:** | Medium |
| **Operations Office Priority:** | 2 of 13 |

## Problem Description Information

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| **Operations Office Program Description:** | The NNSA/NV Environmental Restoration Program encompasses activities that assess the degree of contamination resulting from the testing program at the Nevada Test Site, the Nellis Air Force Range, the Tonopah Test Range, and eight offsite locations, and performs actions required by federal and state regulations. The objects of the Program are to: (1) estimate the maximum extent of contaminant migration, (2) determine its potential risk to the public and the environment, and (3) perform the necessary corrective actions in compliance with applicable regulatory guidelines and requirements. |
| **Need/Problem Description:** | Cost-effective well design and sampling technologies are needed for sampling groundwater for radionuclides and other physical and chemical parameters in deep (up to1,500 meters) wells in remote areas. Current methods may perturb the in situ conditions to the extent that unrealistic solution chemistry and colloidal concentrations may be detected or in other ways result in samples whose analytical results are unrepresentative of formation waters at depth. As part of a review of technologies available in the commercial market during FY2001, four technologies/techniques were identified that may be able to address this need. |
| **Functional Performance Requirements:** | The requirements include:<br>Collecting up to eight liters of water from depths of up to 1500 meters<br>Minimizing the volumes of fluid removed from the well<br>Demonstrating that the sample is representative of the actual conditions<br>Easily decontaminating the equipment between samples. |
| **Definition of Solution:** | The solution will consist of demonstrated, field-ready methods and equipment for collecting groundwater samples at depths up to 1500 meters that are known to be representative of actual formation water conditions. |
| **Targeted Focus Area:** | Subsurface Contaminants |
| **Potential Benefits:** | Groundwater monitoring would be performed at a lower cost than presently incurred. There would be less purge water to be managed and worker exposure to contamination from the purge water or from equipment decontamination would be reduced. |
| **Potential Cost Savings:** | The cost savings is estimated to be $168 million in present-day dollars over a 100-year monitoring period if a technology was implemented at all projected groundwater monitoring wells. |
| **Potential Cost Savings Narrative:** | The cost savings is estimated to be $168 million over a 100 year monitoring period in present day dollars if implemented at all projected groundwater wells. However, potential cost savings are linked with that of need NV01-0200-02S, "Down-Hole, Real-Time Monitoring of Radiation (Mainly Tritium) in Boreholes. It will not be necessary to implement both of these needs at the same well. Consequently, the total potential baseline cost savings are not simply the cumulative cost savings for both technology needs. For example, if an in situ radiation/tritium detector were installed for a well, it would eliminate the need for deep well sampling at that well. |

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| | Likewise, deep well sampling will likely need to take place at some wells; in these cases, an in situ monitor would not be installed. The costs of technology implementation for this need will be refined with time as the strategy for well monitoring and sampling is further defined. |
| **Technical Basis:** | A technology is needed for obtaining representative samples of groundwater at great depths in remote areas while minimizing purge water volumes. |
| **Cultural/Stakeholder Basis:** | Groundwater contamination is of high concern to stakeholders. Stakeholder confidence that the issue is being addressed requires that reliable samples be collected. |
| **Environment, Safety, and Health Basis:** | Worker safety and health will be increased by limiting the installation of pumps and by limiting radiation exposure from purge water. |
| **Regulatory Drivers:** | The monitoring system is required as part of an agreement with the State of Nevada (the Federal Facility Agreement and Consent Order). |
| **Milestones:** | Not applicable |
| **Material Streams:** | RAD contaminated groundwater (1209). Technical risk score 3. Not on critical path to closure. |
| **TSD System:** | Not applicable |
| **Major Contaminants:** | Radionuclides, with tritium being the primary contaminant of concern. |
| **Contaminated Media:** | Groundwater |
| **Volume/Size of Contaminated Media:** | Unknown |
| **Earliest Date Required:** | FY 2002 |
| **Latest Date Required:** | FY 2006 |

## Baseline Technology Information

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| **Baseline Technology Process:** | The current technology involves pumping large volumes of water from deep wells with either dedicated pumps or pumps installed for each sampling event. The installation of pumps requires a drill rig or similar equipment that is very expensive to operate. Considerable decontamination of equipment is required. The pumping produces considerable volumes of contaminated water that may require disposal as radioactive waste. The monitoring is expected to last for the next 100 years. |
| **Life-Cycle Cost Using Baseline:** | The conceptual cost estimate is $420 million in present day dollars for well sampling and monitoring. This cost will be updated as more information becomes available. |
| **Uncertainty on Baseline Life-Cycle Cost:** | The main uncertainty is the number of wells to be monitored in future years. |
| **Completion Date Using Baseline:** | Monitoring is expected to last for the next 100 years. |

## Points of Contact (POC)


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| **Contractor End User POCs:** | Don Van Etten, Bechtel Nevada - Office: 702-295-2446; Fax: 702-295-1313; E-mail: vanettdm@nv.doe.gov<br>Charles Russell, Desert Research Institute - Office: 702-895-0486; Fax: 702-895-0427; E-mail: chuck@dri.edu<br>Robert Eastmond, IT Corporation – Office: 702-295-2203; Fax: 702-295-1824; E-mail: reastmon_it@nv.doe.gov |
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